CLAIMS:

1. A process for electrochemically reducing metal oxide powders and/or pellets in an electrolytic cell that includes a bath of molten electrolyte, a cathode, and an anode, the cathode being in the form of a member having an upper surface for supporting metal oxide powders and/or pellets that is horizontally disposed or slightly inclined and has a forward end and a rearward end and is immersed in the electrolyte bath and is supported for movement so as to cause metal oxide powders and/or pellets on the upper surface of the cathode to move toward the forward end of the member, which process includes the steps of: (a) applying a cell potential across the anode and the cathode that is capable of electrochemically reducing metal oxide supplied to the molten electrolyte bath, (b) continuously or semi-continuously feeding metal oxide powders and/or pellets into the molten electrolyte bath so that the powders and/or pellets deposit on an upper surface of the cathode, (c) causing metal oxide powders and/or pellets to move over the upper surface of the cathode toward the forward end of the cathode while in contact with molten electrolyte whereby electrochemical reduction of the metal oxide to metal occurs as the powders and/or pellets move toward the forward end, and (d) continuously or semi-continuously removing at least partially electrochemically reduced metal oxide powders and/or pellets from the molten electrolyte bath.

2. The process defined in claim 1 wherein step (b) includes feeding the metal oxide powders and/or pellets into the molten electrolyte bath so that the powders and/or pellets form a layer that is one or two particles deep on the upper surface of the cathode.

3. The process defined in claim 1 wherein step (b) includes feeding the metal oxide powders and/or pellets

into the molten electrolyte bath so that the powders and/or pellets deposit as a pile of powders and/or pellets on the upper surface of the cathode and step(c) causes the powders and/or pellets in the pile to be shaken out into a layer that that is one or two particles deep and moves over the upper surface of the cathode toward the forward end of the cathode.

4. The process defined in claim 1 wherein step (c) includes causing metal oxide powders and/or pellets to move on the upper surface of the cathode toward the forward end of the cathode as a layer of powders and/or pellets that is one or two particles deep.

5. The process defined in any one of the preceding claims wherein step (c) includes selectively moving the cathode so as to cause metal oxide powders and/or pellets on the upper surface of the cathode to move toward the forward end of the cathode.

6. The process defined in claim 5 wherein step (c) includes moving the cathode in forward and rearward directions so as to cause metal oxide powders and/or pellets on the upper surface of the cathode to move toward the forward end of the cathode.

7. The process defined in claim 6 includes moving the cathode in a repeated sequence that comprises a short period of oscillating motion in the forward and rearward directions and a short rest period.

8. The process defined in any one of the preceding claims wherein step (c) includes moving the cathode so as to cause powders and/or pellets across the width of the cathode to move at the same rate so that the powders and/or pellets have substantially the same residence time within the bath.

9. The process defined in any one of the preceding claims includes washing powders and/or pellets that are removed from the cell and separating electrolyte that is carried from the cell with the pellets.

10. The process defined in claim 9 includes recovering electrolyte that is washed from the powders and/or pellets and recycling the electrolyte to the cell.

11. The process defined in any one of the preceding claims includes applying a cell potential above a decomposition potential of at least one constituent of the electrolyte so that there are cations of a metal other than that of the cathode metal oxide in the electrolyte.

12. The process defined in claim 11 wherein, in a situation in which the metal oxide is titania the electrolyte be a $CaCl_2$-based electrolyte that includes CaO as one of the constituents, the process includes maintaining the cell potential above the decomposition potential for CaO.

13. The process defined in any one of the preceding claims wherein the particle size of the powders and/or pellets is in the range of 0.5-4 mm.

14. An electrolytic cell for electrochemically reducing metal oxide powders and/or pellets, which electrolytic cell includes (a) a bath of a molten electrolyte, (b) a cathode in the form of a member having an upper surface for supporting metal oxide powders and/or pellets that is horizontally disposed or slightly inclined and has a forward end and a rearward end and is immersed in the electrolyte bath and is supported for movement so as to cause metal oxide powders and/or pellets on the upper surface of the cathode to move toward the forward

end of the cathode, (c) an anode, (d) a means for applying a potential across the anode and the cathode, (e) a means for supplying metal oxide powders and/or pellets to the electrolyte bath so that the metal oxide powders and/or pellets can deposit onto an upper surface of the cathode, (f) a means for causing metal oxide powders and/or pellets to move over the upper surface of the cathode toward the forward end of the cathode while in contact with molten electrolyte whereby electrochemical reduction of the metal oxide to metal can occur as the powders and/or pellets move toward the forward end, and (g) a means for removing at least partially electrochemically reduced metal oxides from the electrolyte bath.

15. The cell defined in claim 14 wherein the cathode is a plate.

16. The cell defined in claim 14 or claim 15 wherein the means for causing metal oxide powders and/or pellets to move over the upper surface of the cathode includes a means for moving the cathode so as to cause movement of metal oxide powders and/or pellets.

17. The cell defined in claim 16 wherein the means for causing metal oxide powders and/or pellets to move over the upper surface of the cathode includes a means for moving the cathode in forward and rearward directions.

18. The cell defined in any one of claims 14 to 17 wherein the cathode is formed to cause metal oxide powders and/or pellets to move on the upper surface of the cathode toward the forward end of the cathode as a layer of powders and/or pellets that is one or two particles deep.

19. The cell defined in claim 18 wherein the cathode is formed with an upstanding lip at the forward end that causes powders and/or pellets to build-up behind the lip.

20. The cell defined in claim 18 or claim 19 wherein the upper surface of the cathode is formed with a series of transversely extending grooves that promote close packing of the powders and/or pellets.

21. The cell defined in any one of claims 14 to 20 wherein the means for applying an electrical potential across the anode and the cathode includes an electrical circuit in which a power source is connected to a forward end of the cathode.

22. The cell defined in any one of claims 14 to 21 wherein the anode extends downwardly into the electrolyte bath and is positioned a predetermined distance above the upper surface of the cathode.

23. The cell defined in claim 22 includes a means for moving the anode downwardly into the electrolyte bath as the anode is consumed to maintain the predetermined distance between the anode and the cathode.